HyMeX

HYdrological cycle in Mediterranean EXperiment

"Extreme event impact on 3-D thermohaline structure variability in the Aegean-Levantine region"

Sarantis Sofianos
Ocean Physics and Modelling group
University of Athens, Greece

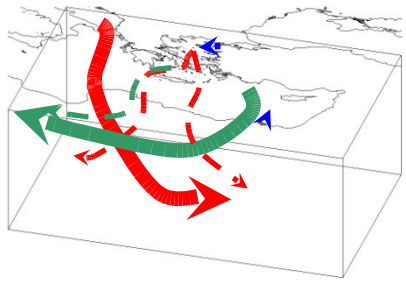
3rd HyMeX workshop 1-4 June 2009, Heraklion, GREECE

- **How robust is the thermohaline circulation pattern of the Eastern Mediterranean?**

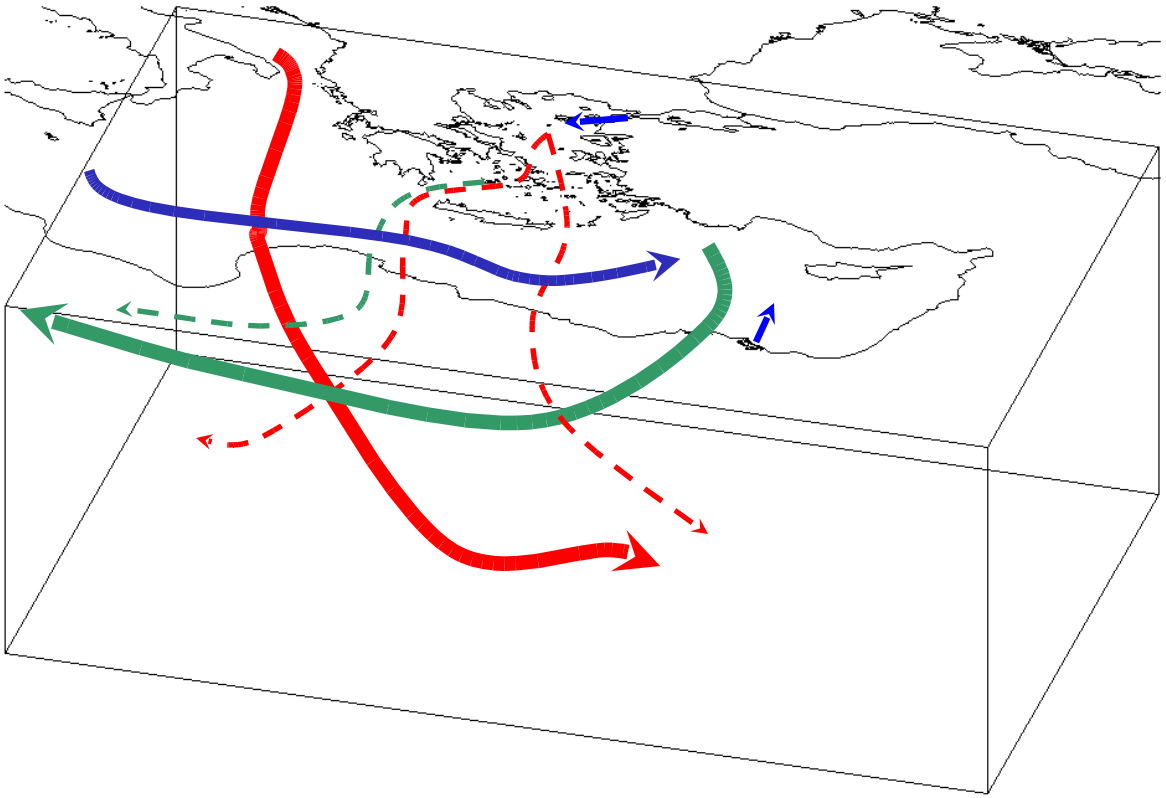
- **What is the impact of long term (atmospheric and/or lateral) changes-variability on the thermohaline cells in the Eastern Mediterranean?**

- **How can extreme events alter the thermohaline circulation in the Aegean-Levantine region (and further downstream)?**

- **Combine data/models to evaluate the above.**

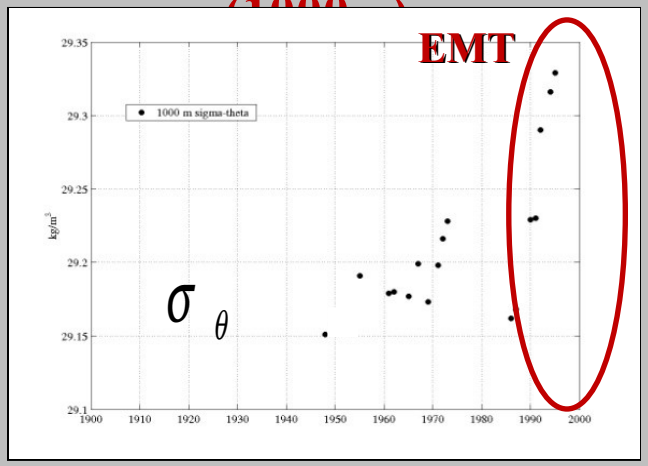


Traditional Scheme

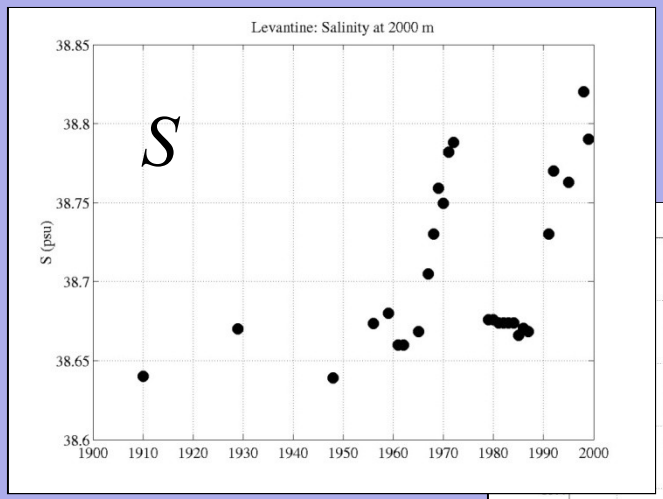


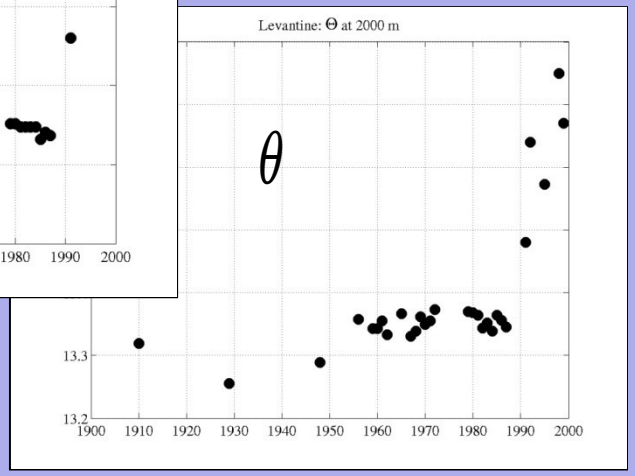
How typical is this scheme?

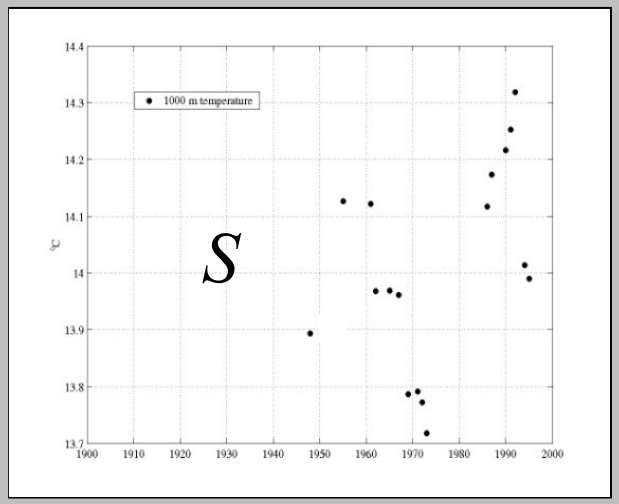
Cretan Deep Waters (1000 m)

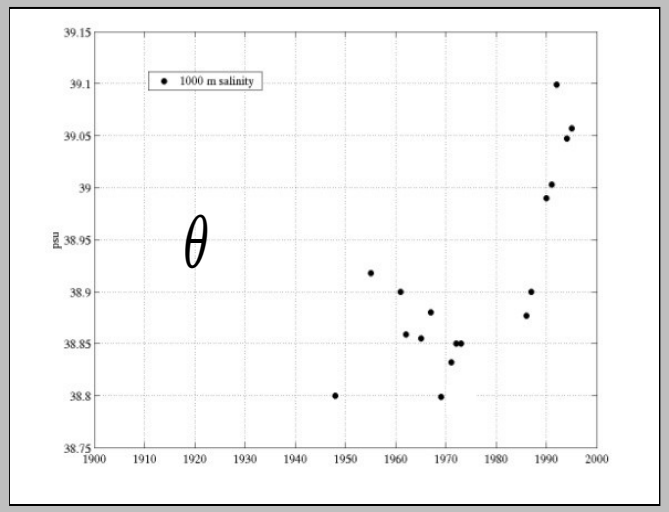


Levantine Deep Waters (2000m)

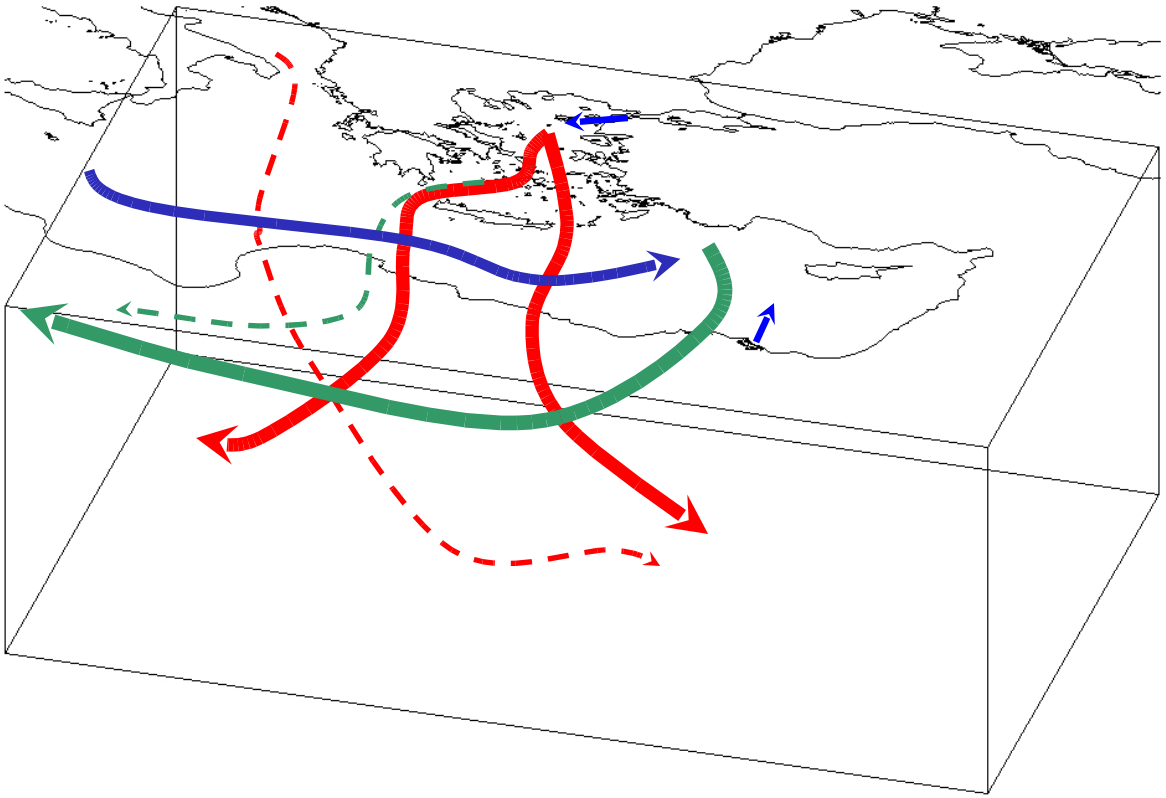






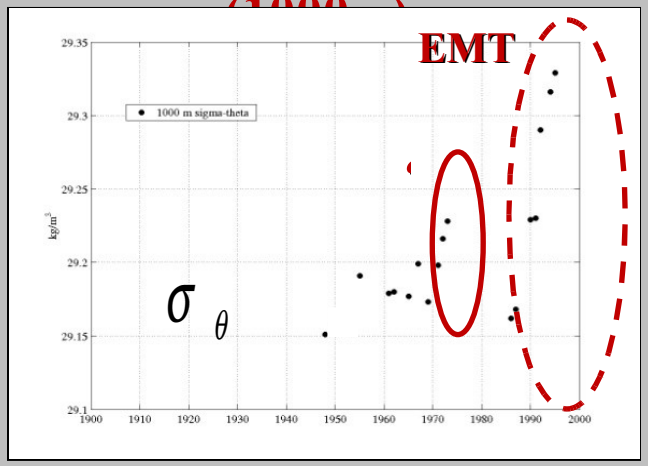


EMT Scheme

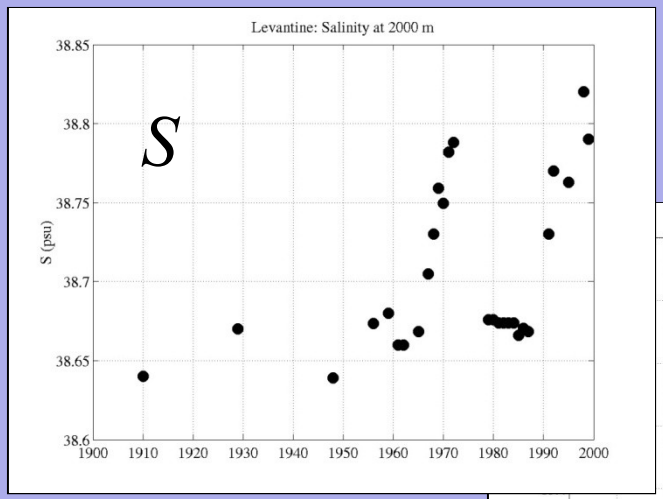


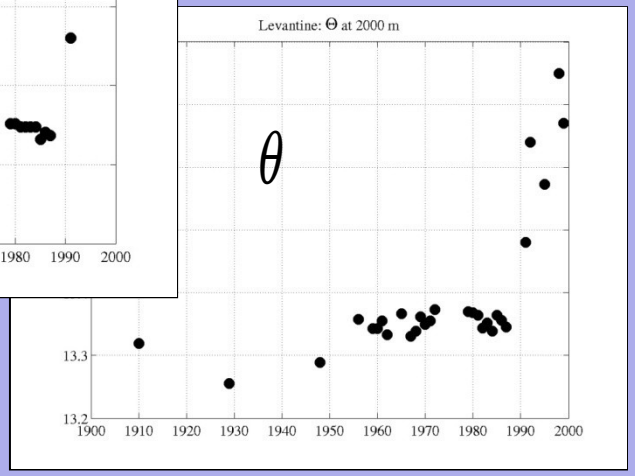
Is this just a coincidence of forcing mechanisms or an indication of thermohaline cell sensitivity?

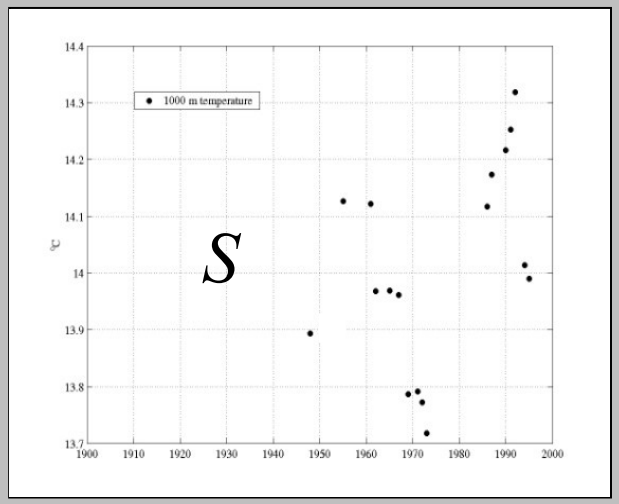
Cretan Deep Waters (1000)

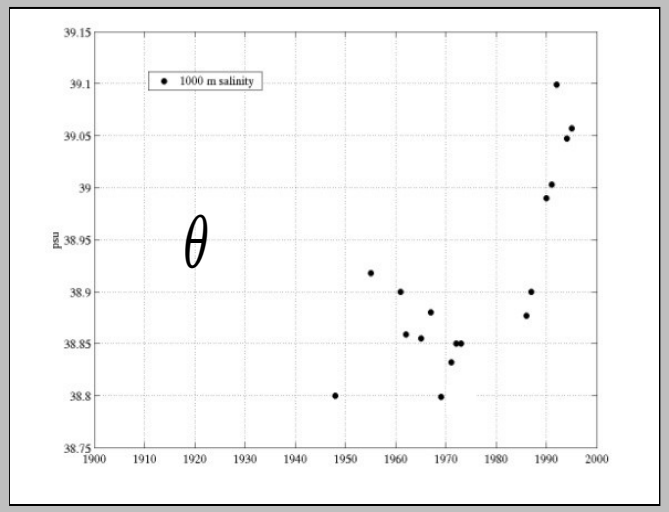


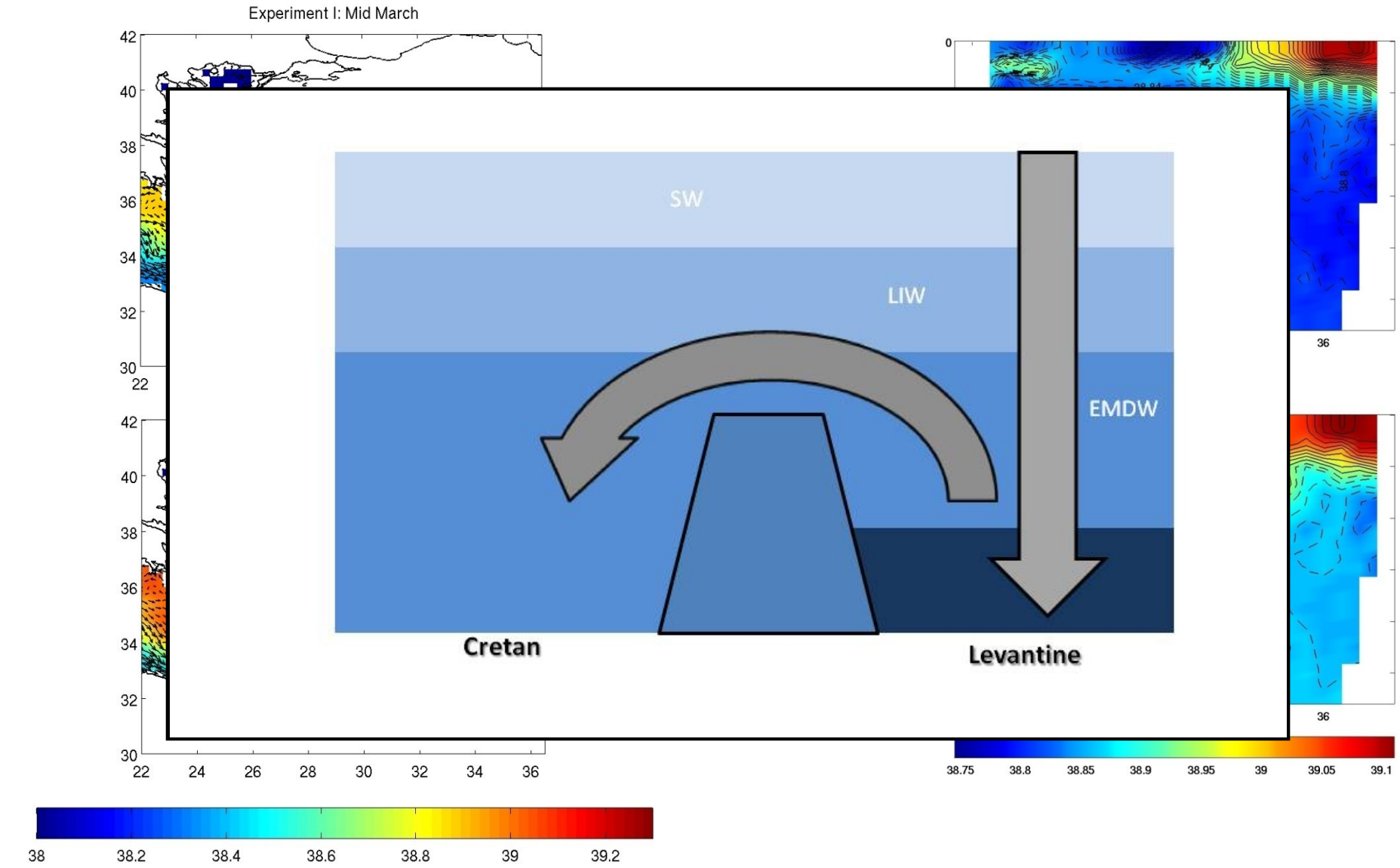
Levantine Deep Waters (2000*m*)





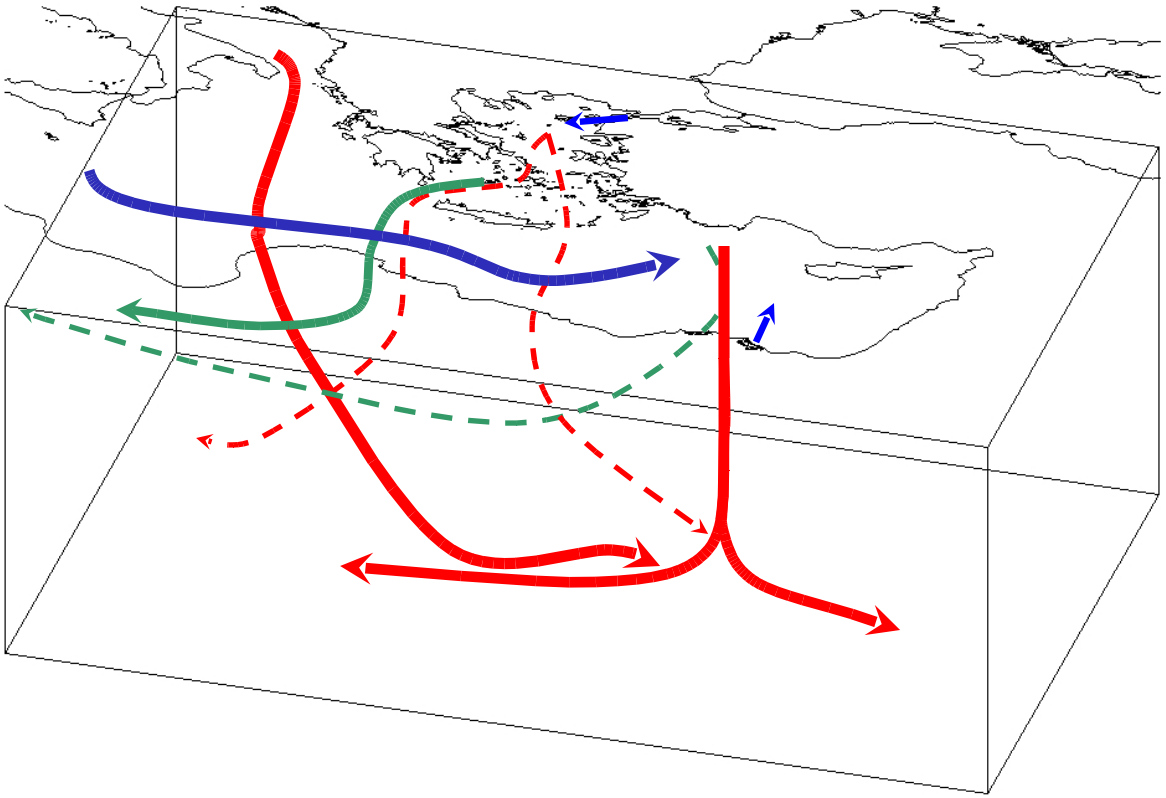






Skliris, Sofianos, Lascaratos, JMS, 2007

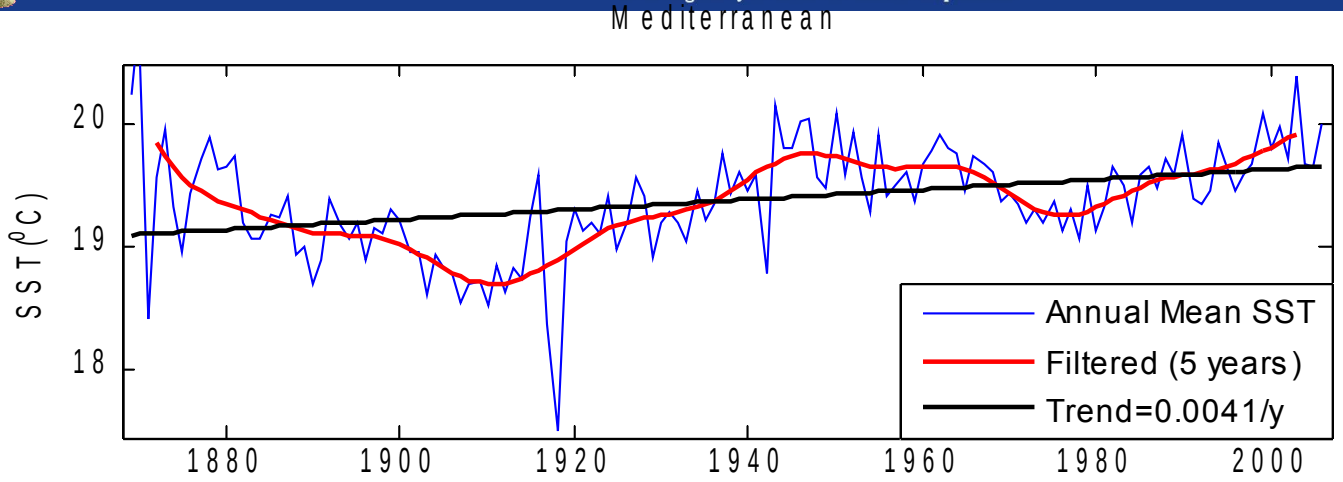
Additional Scheme

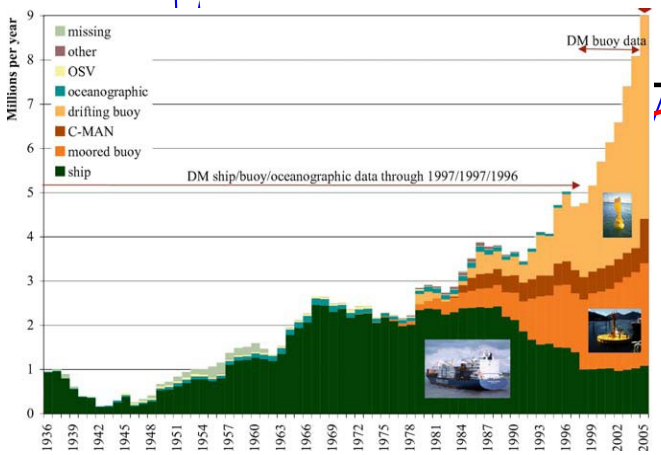


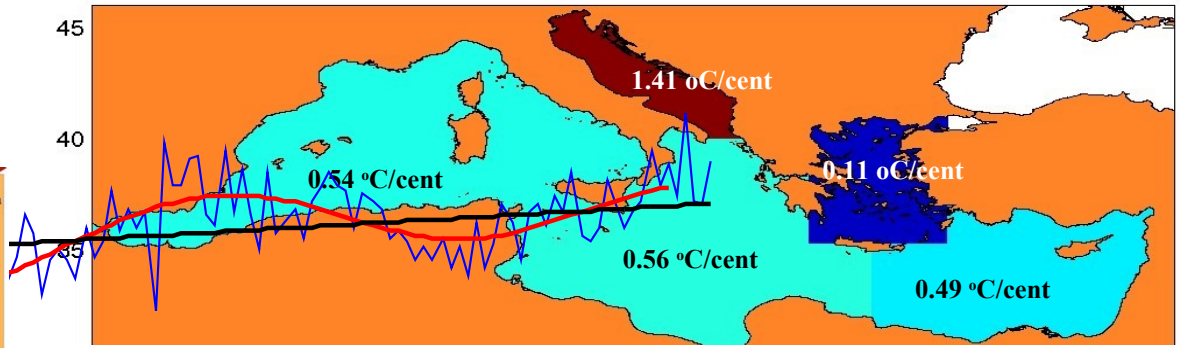
What causes this type of variability?

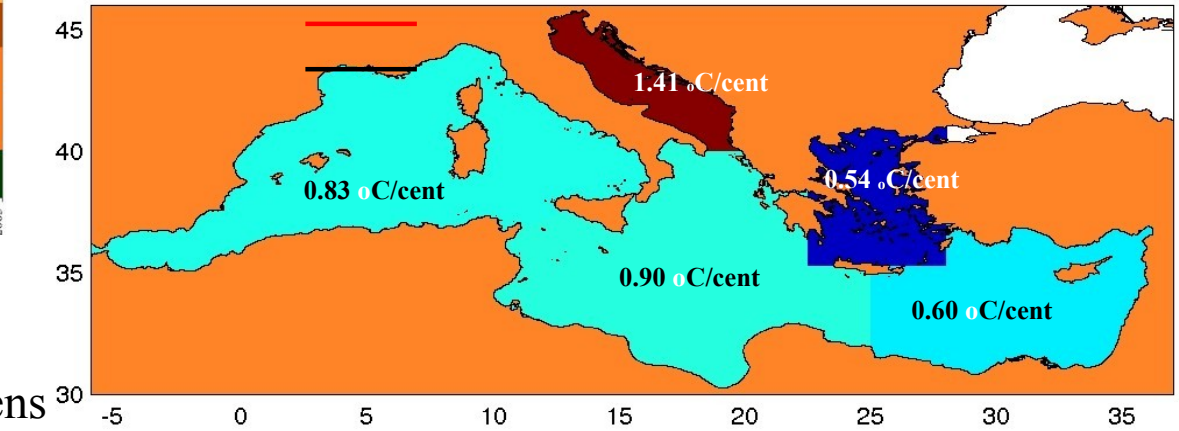
Long-term changes

Dominant period ~80 years



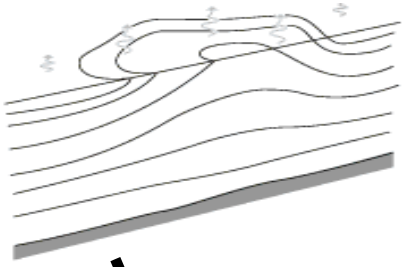




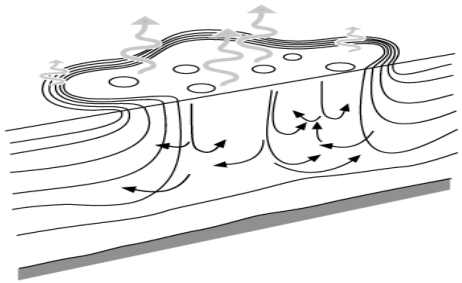


Axaopoulos,MSc Thesis,Univ. Athens

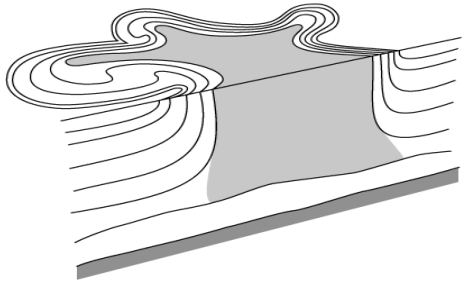
Pre-conditioning



Violent mixing



Sinking and spreading



D.W.F.Phases

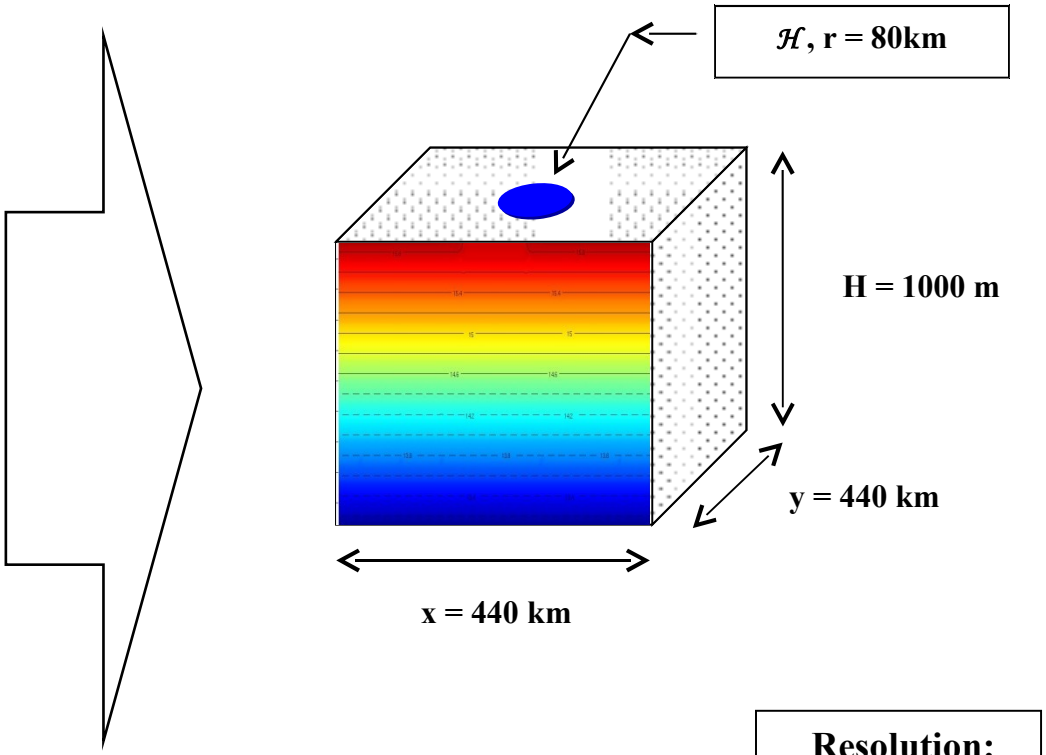
Effect of extreme events (buoyancy loss rate)

… communication with the rest of ocean

Marshall and Schott, 1999

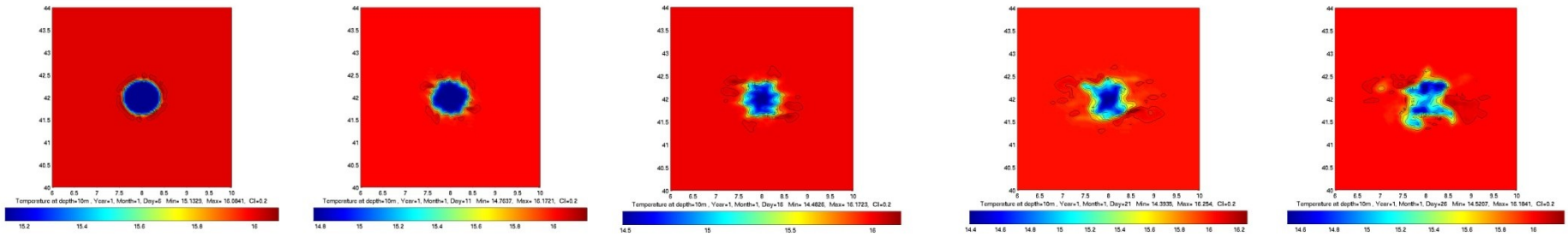
Compare 1-D approach with 3-D results (1000 W/m^2)

Forcing rates:
100 W/m^2
250 W/m^2
500 W/m^2
750 W/m^2
1000 W/m^2
1250 W/m^2
1500 W/m^2
2000 W/m^2

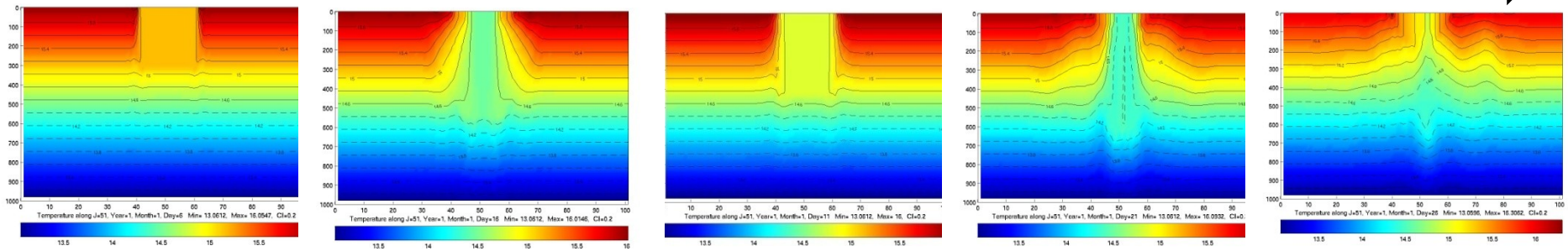


Resolution:
0.04 x 0.04

Krokos, MSc Thesis, Univ. Athens



5days 10 days 15 days 20 days 25 days



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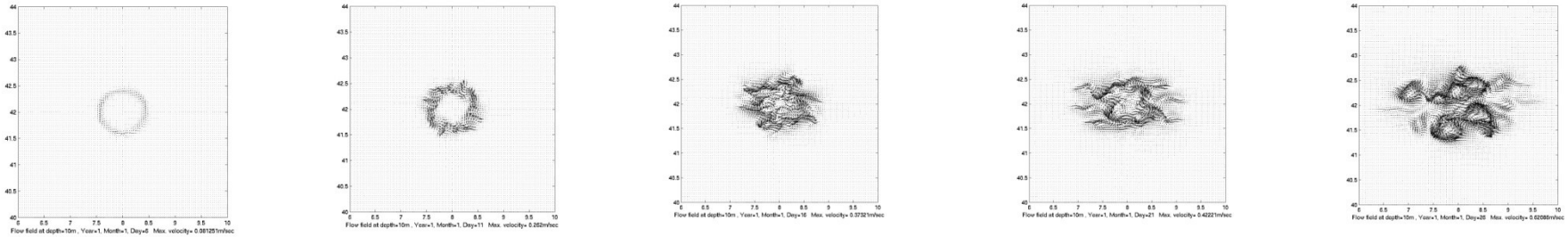
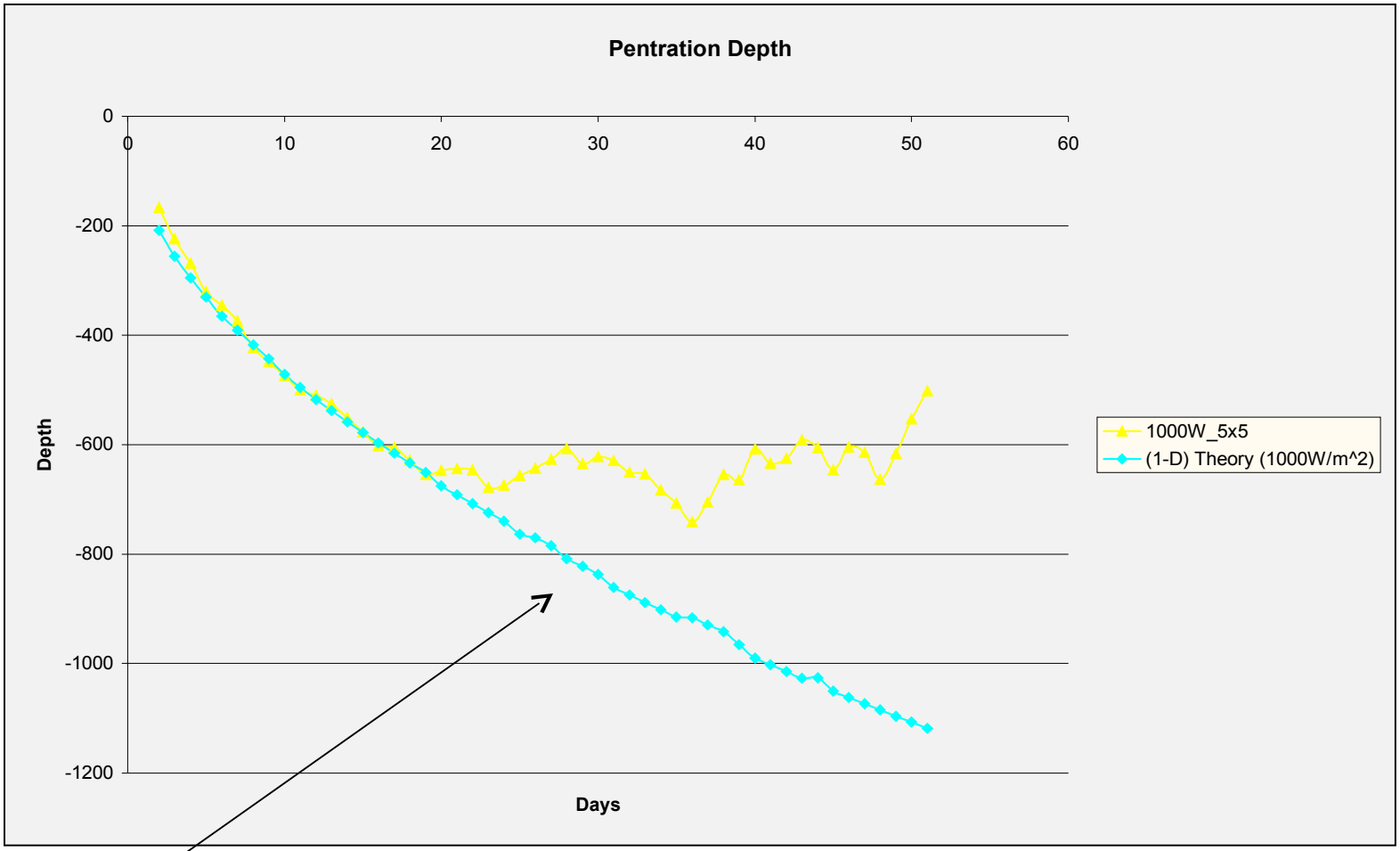
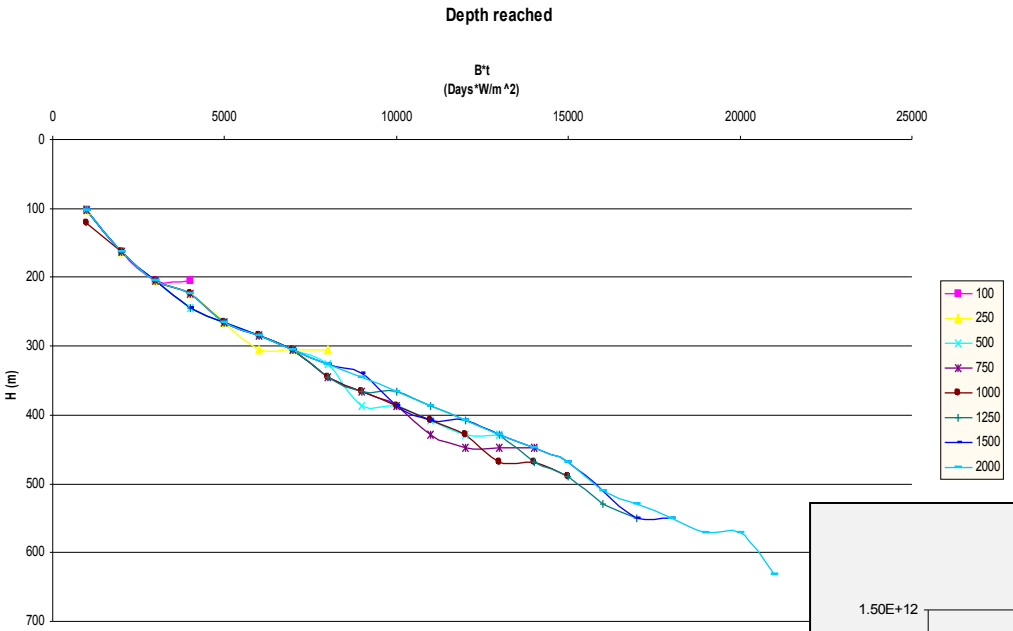
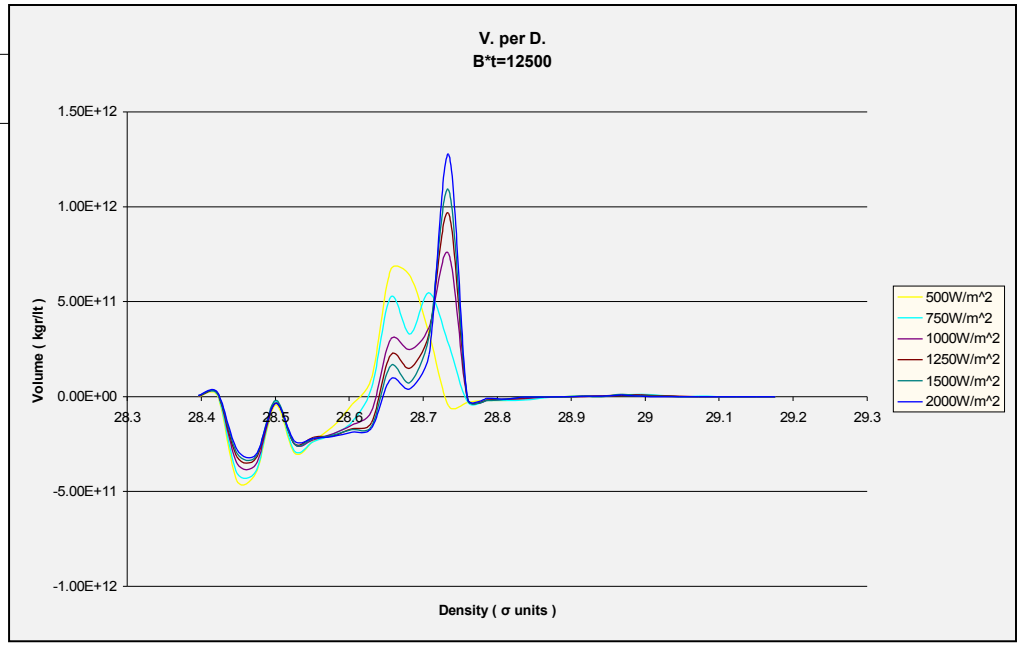




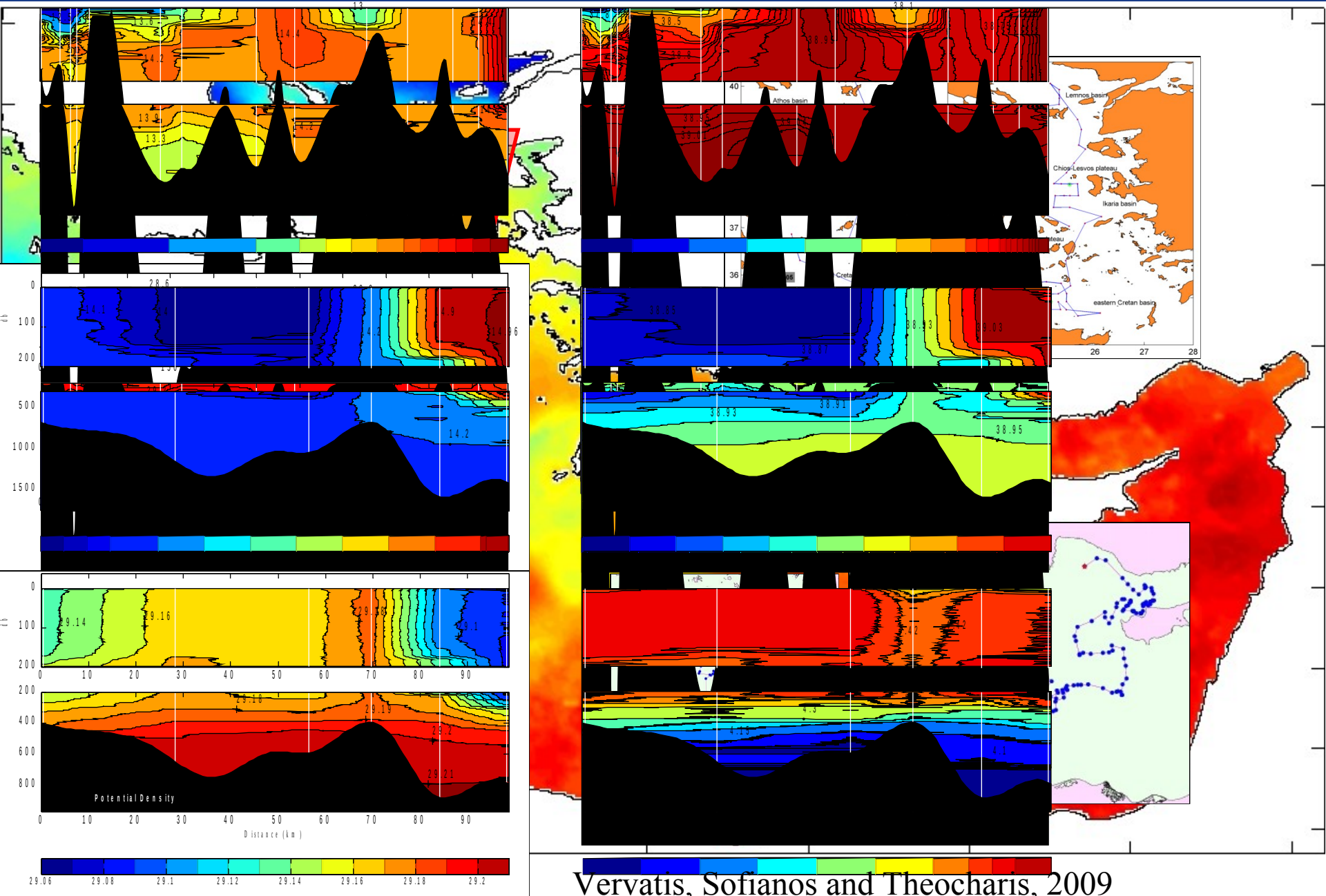
$$H = \frac{(2Bt)^{1/2}}{N}$$



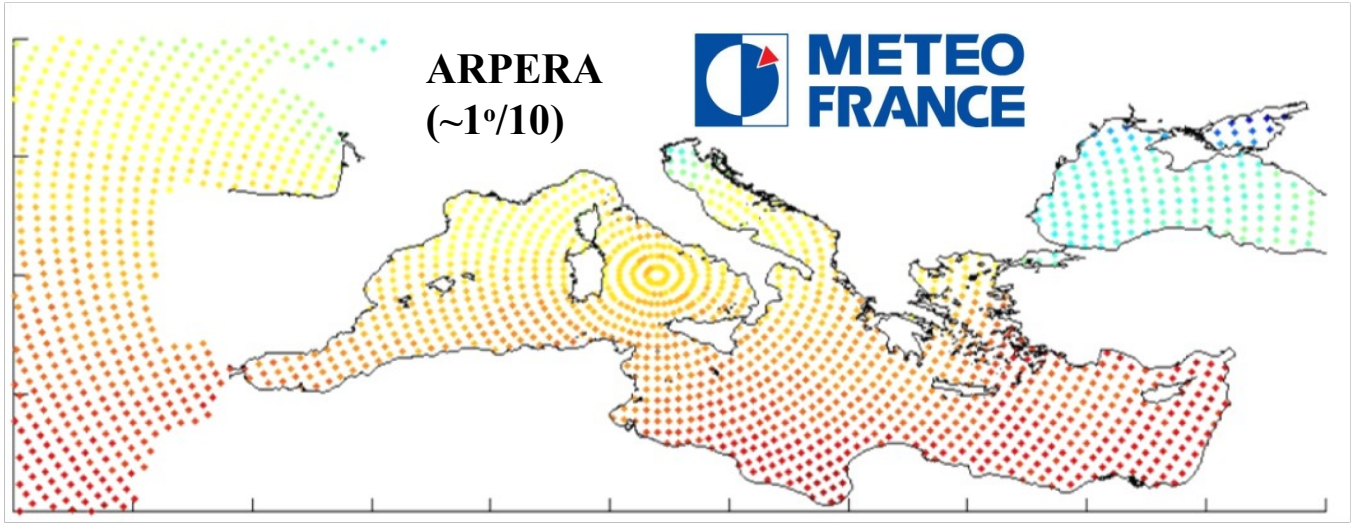
Effect of buoyancy loss rate



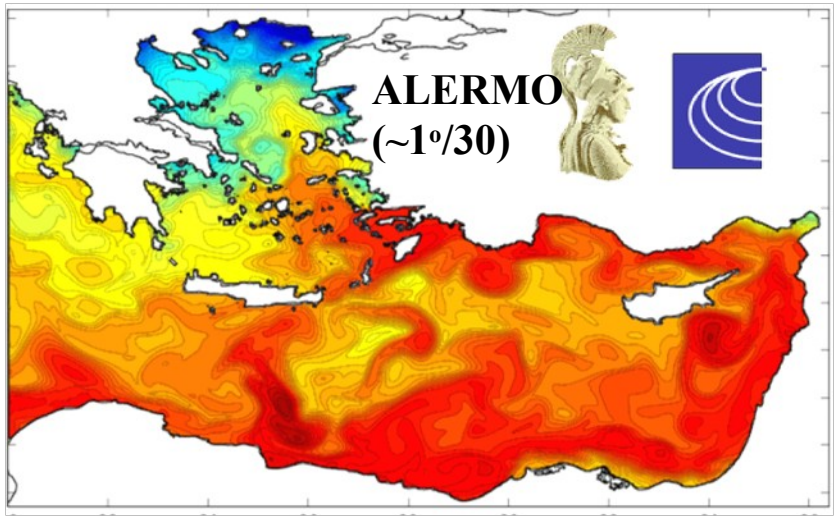
The rate of buoyancy loss is very important in determining the final characteristics of the water mass formed



Vervatis, Sofianos and Theocharis, 2009



1960-2001



Extreme Events

- How robust is the thermohaline circulation pattern of the Eastern Mediterranean?

Less than we thought

- What is the impact of long term (atmospheric and/or lateral) changes-variability on the thermohaline cells in the Eastern Mediterranean?

  - **Changes the preconditioning**
  - **Induces different behavior of extreme events**

- How can extreme events alter the thermohaline circulation in the Aegean-Levantine region (and further downstream)?

Crucial in determining the thermohaline cell structure

- Combine data/models to evaluate the above: **Beyond the idealized approach**

Thank you!